Notes.

THE KING has been pleased to approve of the following awards this year by the president and council of the Royal Society:—A Royal medal to Mr. W. Bateson, for his contributions to biological science, especially his studies in genetics; and a Royal medal to Prof. G. H. Hardy, for his researches in pure mathematics, particularly in the analytic theory of numbers and allied subjects. The following awards have also been made by the president and council:—The Copley medal to Mr. H. T. Brown, for his work on the chemistry of carbohydrates, on the assimilation of atmospheric carbon dioxide by leaves, and on gaseous diffusion through small apertures; the Rumford medal to Lord Rayleigh, for researches into the properties of gases at high vacua; the Davy medal to Mr. C. T. Heycock, for his work in physical chemistry, especially on the composition and constitution of alloys; the Darwin medal to Prof. R. H. Biffen, for his work on scientific principles applied to the breeding of plants; and the Hughes medal to Prof. O. W. Richardson, for his work in experimental physics, especially thermionics.

DR. H. DESLANDRES, president of the Paris Academy of Sciences, gave, at the meeting on October 4, an eloquent *éloge* on Sir Norman Lockyer, who was a correspondant of the Academy in the section of astronomy. He referred to Sir Norman as one of the founders of physical astronomy who approached science along untrodden paths and with whose name great discoveries are associated. Among the researches and conclusions to which Dr. Deslandres directed particular attention were those of the observation of solar prominences in broad daylight, the discovery of helium, the effect of variation of pressure on the width of hydrogen lines in prominences, the application of the Doppler-Fizeau principle to the spectroscopic determination of velocities in prominences, dissociation of chemical elements, the temperature relations of long, short, and enhanced lines in spectra, the correlation between solar and terrestrial meteorology, and stellar classification on an ascending as well as on a descending temperature scale as described in "The Meteoritic Hypothesis" and "Inorganic Evolution." Reference was also made to the Hill Observatory, Sidmouth, as "already one of the best provided in England," and Dr. Deslandres concluded his appreciative address with the words: "Dans son ensemble, l'œuvre est considérable et touche aux plus hautes questions de la Science. Sir Norman Lockyer est assurément un des plus grands savants de l'Angleterre, et un des plus grands astronomes de tous les temps. L'Académie s'honore de l'avoir compté parmi ses membres; elle adresse à sa veuve et à ses enfants ses plus vives condoléances."

A MEETING of the International Commission for Weather Telegraphy, which was appointed by the International Meteorological Conference at Paris in October, 1919, will be held at the Air Ministry during the week November 22–27. The following delegates are expected to attend the meeting:—Lt.-Col. E. Gold (president), Meteorological Office, Air Ministry; M. A. Angot, Bureau Central Météorologique, Paris; Col. L. F. Blandy, Controller of Communications, Air Ministry; Dr. van Bemmelen, Meteorological Observatory, Batavia; Col. Delcambre, Service Météorologique Militaire, Paris; Prof. F. Eredia, Ufficio Central di Meteorologia, Rome; Prof. E. van Everdingen, Meteorologisch Instituut, De Bilt, Holland; Gen. Ferrié, Ministère de la Guerre, Paris; Capt. Franck, Service de la Navigation Aérienne, Paris; Señor José Galbis, Servicio Meteorologico Español, Madrid; Lieut. H. D. Grant, Meteorological Office, Air Ministry; Dr. Hesselberg, Meteorologiske Institut, Christiania; Col. Matteuzzi, Servizio Aerologico, Rome; Prof. A. de Quervain, Central Meteorological Office, Zurich; M. Rey, Ministère de l'Agriculture, Paris; Capt. C. Ryder, Meteorologische Institut, Copenhagen; Mr. T. Thorkelsson, Meteorological Service, Reykjavik; and Dr. A. Wallén, Meteorologiske Hydrografiske Anstalt, Stockholm. Since the war much progress has been made in different countries in the development of codes for telegraphic reports of the meteorological information which experience in the war and the needs of aerial navigation indicated as necessary. The main object of the Commission is to co-ordinate these developments in the revision and extension of the codes prepared at the last meeting of the Commission, which was held in London in September, 1912.

THE Nobel prize for physics for 1920 has been awarded to Dr. C. E. Guillaume, director of the International Bureau of Weights and Measures at Sèvres. The prize for 1919 has been reserved.

THE Chadwick Trustees announce that a public lecture will be given by Prof. J. B. Farmer, entitled "Some Biological Aspects of Disease," on Thursday, November 25, at 5.15 p.m. The lecture will be delivered in the lecture hall of the Medical Society of London, 11 Chandos Street, W.1.

THE Woburn Fruit Farm, which was carried on from 1894 to 1918 by the Duke of Bedford, and since then by means of a grant from the Development Fund administered by the Committee of the Rothamsted Experimental Station, is to be closed at Christmas owing to the continued ill-health of Mr. Spencer U. Pickering, which renders him unable to continue his experimental work there.

THE gold medal of the Institution of Mining and Metallurgy, the highest distinction in the power of the council to bestow, has been awarded to Sir Thomas Kirke Rose "in recognition of his eminent services in the advancement of metallurgical science, with special reference to the metallurgy of gold." The Consolidated Gold Fields of South Africa, Ltd., gold medal and premium of forty guineas have been awarded to Mr. H. Livingstone Sulman for his paper entitled "A Contribution to the Study of Flotation" (Transactions, vol. xxix., 1919–20).

AT the anniversary meeting of the Mineralogical Society held on November 9 the following officers and members of council were elected:—*President:* Sir William P. Beale, Bart. *Vice-Presidents:* Prof. H. L. Bowman and Mr. A. Hutchinson. *Treasurer:* Dr. J. W. Evans. *General Secretary:* Dr. G. T. Prior. *Foreign Secretary:* Prof. W. W. Watts. *Editor of the Journal:* Mr. L. J. Spencer. *Ordinary Members of Council:* Dr. A. Holmes, Miss M. W. Porter, Mr. R. H. Rastall, Sir J. J. H. Teall, Mr. A. F. Hallimond, Dr. F. H. Hatch, Mr. J. A. Howe, Lt.-Col. W. Campbell Smith, Mr. T. V. Barker, Prof. C. G. Cullis, Mr. W. A. Richardson, and Dr. A. Scott.

Mr. J. Hargreaves presided over the annual meeting of the Chaldæan Society held at the Great Northern Hotel on November 13. Reports of astronomical work and progress were received from the local sections established at Luton and Tottenham, and the formation of new sections for Warwickshire and Hertfordshire was announced. Special attention was directed to the encouraging work of the society in the observation of the zodiacal light, variable stars, sun-spots, the moon, and photographic work. The secretary, Mr. S. S. Clerk-Maxwell, King's College, Cambridge, expressed a hope for further development and for the formation of local sections south of the Thames. *The Chaldaean* is now published for the society by Messrs. Geo. Philip and Son, Ltd., 32 Fleet Street, E.C.4.

A joint meeting of the Physical and Optical Societies for the discussion of "The Making of Reflecting Surfaces" will be held on Friday, November 26, at 7 p.m., at the Imperial College of Science and Technology, South Kensington, S.W.7. The programme will be divided into two parts: (*a*) Technical methods and processes, and (*b*) properties of reflecting surfaces (reflecting powers, etc.). Some demonstrations of actual processes will also be given. Mr. R. Kanthack is making a complete bibliography and *résumé* of previously published work on this subject, and will contribute a description of the results of his investigation to the discussion. Papers have been promised by representatives from manufacturing firms, astronomical observatories, and other scientific institutions. A complete programme will be issued during the week. Tickets may be obtained from the secretary of the Physical Society (Imperial College of Science) or of the Optical Society (39 Victoria Street, Westminster, S.W.1).

Replying to a question in the House of Commons on November 15, Mr. Lloyd George said: "The whole subject of chemical warfare has been under careful consideration by the Cabinet during the past year. It was decided on March 4 that the question should be raised at the Council of the League of Nations. It is, I am sure, obvious to the House that this is a question on which our action must depend on that of other nations. It was realised, therefore, that, as other countries have been continuing to develop this method of warfare, the safety of our fighting Services would be seriously jeopardised by lack of similar development in this country, and it was decided on May 12 that, pending a pronouncement on the subject by the League, the fighting Services should continue their researches and experiments. The War Office Committee has been constituted as part of the organisation necessary for the continuation of these studies. The whole subject will, of course, have to be reconsidered when the Council of the League of Nations has made its pronouncement."

Representatives of countries included in the League of Nations and of America met in Paris on October 17–21 for the purpose of forming an International Union against Tuberculosis, which would continue the work carried on by the old international association, the last conference of which was held in October, 1913, at Berlin. Great Britain's representatives were Sir Robert Philip, of the National Association for the Prevention of Tuberculosis and the Ministry of Pensions; Dr. Nathan Raw, also from the National Association; and Dr. Halliday Sutherland, of the Ministry of Pensions. The conference was presided over by M. Léon Bourgeois, and the principal subject raised was the necessity for the early diagnosis of tuberculosis and the methods which could be used for this purpose. The headquarters of the International Union against Tuberculosis will be at Geneva, and the next conference will be held in London in 1921.

Mr. E. W. Shann referred in his letter in Nature of November 11 to the statement in the leading article in our issue of October 28 that there was "little or no evidence" that the museums of our public schools "are used in school teaching." This statement was based not only on the Report of the British Association Committee, but also on the confessions of public-school science masters in annual conference in 1916, and on personal inquiries from boys and masters while the article was being written. Oundle is a marked exception to the prevailing apathy, yet Mr. Shann in his long and interesting letter devotes only ten lines to the use of the museum in class-work. Such small evidence as there is, in addition to that from Oundle, comes, as in Mr. Shann's case, from the biological and geological sides. This is not because the subject or the material is more suited to the museum method, but because the teachers have had a scientific training and have some appreciation of a museum's usefulness. More might be done even here, but it is in the teaching of history, ancient and modern, and in the elucidation of ancient or foreign authors, that so much more use might be made of school museums.

In a brochure entitled "A Proposal to Increase the Purchasing Power of the Penny" Mr. Harry Allcock puts forward the view that the value of the penny as 1/240th of the pound sterling has proved too low for post-war requirements, and that, in consequence, penny prices have been advanced by 50 per cent. in many cases where a smaller increase would have satisfied the seller had a single coin been available intermediate in value between 1*d*. and 1½*d*. As a result, two coins are now needed in millions of daily transactions where formerly only one was used, and this has led to a shortage of copper coins and much inconvenience to the public. The provision of either additional copper coins or new nickel coins would involve national expenditure, to obviate which Mr. Allcock suggests that the Government should now increase the token value of the penny by 20 per cent., thus making it represent one-tenth instead of one-twelfth of the shilling and increasing its purchasing power proportionately. The present value of the pound sterling and of all existing notes and silver coins relative to the pound would be unchanged, but the shilling would be divided into ten pence. The consequent loss to the Mint when the copper coins already in circulation became so worn as to need withdrawal would be insignificant, and the risk of the public hoarding copper coins in anticipation of the change could be avoided by imposing this without notice; while holders of large stocks of copper coins for business purposes might be called upon to surrender to the State the amount by which their holdings were increased in value.

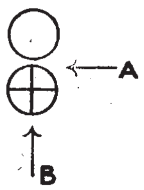
THERE can be no doubt that scientific progress in relation to agriculture has been seriously hampered in the past by the poor material prospects offered to the scientific worker, and the Ministry of Agriculture, in recognising the fact and in attempting to remove the defect, has shown a spirit of enlightened goodwill which is of hopeful augury. The provision of a grant earmarked to cover the salaries of workers in universities and in institutions such as the Rothamsted Experimental Station, in addition to, and separate from, a grant for laboratory and general research expenses, is a real effort to ensure that the workers shall have some security of tenure and some prospect of a settled career in the prosecution of research. The principle is sound, but the practical application is as yet not entirely successful. A system of grading the workers is perhaps inevitable, and the salaries allotted to the different grades are in some respects not unreasonable. But the annual increments are too small, especially during the years when the average worker is marrying and his expenses are increasing, and there is not sufficient range between the extremes of the scale, *e.g.* a worker recently graduated and beginning his career receives 450*l.*; the same man ten years later, with a wife, two or more children, and a position to maintain, receives only twice that amount, and is actually worse off than before. The total number of graded posts is much too small even to cover only those already working in agricultural research. That will, no doubt, be improved as time goes on, but meanwhile it leads to stagnant promotion and invidious selection. There must be something seriously at fault when (to take only one particular instance) a worker of more than thirteen years' experience in research, of acknowledged eminence and authority in an important subject, should be offered, and have in the meantime to accept, a post in the third grade (called "junior assistants"), and be classed along with those at the start of their career with no record of solid achievement behind them.

THE authorities of the New York Zoological Society are justly proud of the fact that a chimpanzee was born in the Gardens of the society on July 14. A very welcome account of this event is given in the Zoological Bulletin of the society for September (vol. xxiii., No. 5) by Mr. W. Reid Blair. The mother of this infant is about ten years old, and was taken in West Africa; the father is about eight years old, and was taken in what was German East Africa. The offspring of these two animals at birth weighed about 3 lb., and measured 16 in. in length. The body was but sparsely clothed with hair, save on the head, back, and arms. In its less prognathous jaws and in the great relative size and form of the ears it differs conspicuously from the adult chimpanzee. Unfortunately, the mother was unable to nurse it properly, so that it lived but a few days. During this time, however, some interesting observations were made upon the behaviour of the mother in regard to her treatment of her infant. Only once before has the chimpanzee bred in confinement. This was in Cuba in 1915.

IN Report No. 9 of the Industrial Fatigue Research Board Mr. P. M. Elton describes his investigations on output in the weaving-sheds of two silk mills. The observations lasted for a continuous period of fifteen weeks, and represent the output of forty-seven experienced weavers. At each mill it was found that the output steadily improved during the course of the experimental period. This was due mainly to the diminishing need of artificial light. In the latter half of February and the first week of March, when no artificial lighting whatever was necessary, the output during the first and last hours of the working day was 11 per cent. greater than at the same hours in January, when lighting was required, though the output in the middle hours of the day (when no artificial light was required in either instance) was practically the same. It might be thought that such a result argued inadequacy of the artificial lighting, but photometric measurements showed that the light was quite good. Another factor which influenced output was the temperature of the weaving-sheds. It was found that a rise of temperature from 59° F. to 65° F. caused a 10 per cent. improvement in output, but no definite relationship between output and humidity could be traced. The practical importance of Mr. Elton's investigations needs no comment. It is only by careful and accurate observations such as he has described that the conditions necessary for maximum efficiency can be ascertained.

IN Memoir No. 6 of the Entomological Series of the Agricultural Department of India, Ramachandra Rao gives a lengthy report of an inquiry into the efficiency of indigenous insect pests as a check on the spread of Lantana in India. This plant is a noxious weed in most parts of India and Burma; various other plants which have been introduced for ornamental purposes have also got, or are getting, out of hand, and are likely to prove sources of future trouble. A native of South and Central America, it has been introduced by man into many tropical countries, and in all suitable localities it is a scourge, displacing the native vegetation and often seriously interfering with the natural regeneration in forests. In the Hawaian islands an Agromyzid fly introduced from Mexico, the larvæ of which live in the fruits of Lantana, has proved a valuable check, though it has not by any means exterminated the plant. In work of this nature it has to be considered whether the introduced species is likely to turn to plants of economic value and thus do more harm than good. It is necessary, therefore, to make quite sure of this vital point before introducing the Agromyzid into India. The author of this memoir has brought to light a number of insects attacking Lantana in India. The most efficient of these appears to be a small plume moth (*Platyptilia pusillidactyla*), the caterpillar of which feeds on the flower-heads and considerably reduces the number of seeds produced. Its efficiency, however, would be much greater were it not so subject to the attacks of Hymenopterous parasites. No insect is likely to do more than act as a check upon the reproductive capacity of the plant, and until such insects can be satisfactorily brought into operation, the eradication of the plant in (at present) lightly infested districts by cultural methods seems to be the only feasible course.

RECENT investigation into the irregularities of the heart illustrates the great value of researches which apparently have no practical application. The electrical phenomena of muscle and nerve were thought to be of merely academic interest, but after the perfection of the Einthoven galvanometer these electrical reactions became of great use in the study of the action of the heart. By placing pairs of electrodes on the surface of a muscle, as shown by the two circles of the accompanying diagram, it is found that a wave of excitation travelling in the direction of arrow A will reach both electrodes at the same time and the electrical response will be insignificant, but a wave of excitation travelling in the direction of arrow B will reach the electrode, marked with a cross, first, so that an appreciable electrical response will result, and the direction of the electrical current will indicate the direction in which the wave is travelling; the commencement of the electrical response shows the time at which the wave of excitation reaches the electrode. By this method Dr. T. Lewis and his co-workers have followed the path of the excitation in the disorder known as auricular fibrillation (see *Heart*, August, 1920, vol. vii., No. 4). The normal heart-beat starts at a locality known as the sino-auricular node, and spreads in all directions over the auricle. When the wave of excitation reaches the extremities of the auricle it cannot pass back because it is dammed by the refractory period of the contracting auricle. In auricular flutter the wave of excitation passes down one side and up the other, so that it reaches the starting point after the muscle has relaxed. Thus the wave can follow in the same direction and a "circus" movement becomes established. The result is that the auricle beats at a rate of more than 300 contractions per minute. It is not known why the auricle allows the wave of excitation to pass in one direction only, but once it is started it continues because the auricular muscle relaxes just before the wave of excitation reaches it, and the wave of excitation does not catch up to the refractory period of the contracting muscle.



DR. J. RUNNSTRÖM, of the Zootomical Institute, Stockholm, has long been occupied with experiments on Echinoderm larvæ. Among others, he has cut away portions of the larvæ and observed the further development either in those portions or in the individuals from which they have been removed. In *Bergens Museums Aarbok*, 1917–18 (1920), he tells us how he has removed from the larva of a sea-urchin (*Parechinus miliaris*) the sunken area that would in the normal course of metamorphosis produce the young urchin. This did not prevent the formation of a new sinking or infolded sac of similar character, though, owing to the regeneration of the hydrocœl (whence the characteristic water-vascular system develops), the formation of an actual echinoid did not proceed. Even a fragment removed from the same side (the left) of the larva displayed a like infolding, so that a single larva might thus be induced to form three sacs. These results show that in this case the laying down of an organ does not, as Driesch has supposed, limit the faculty of the remaining cells to form a corresponding organ, or perhaps one should say "of the neighbouring cells," for fragments removed from the right side of the larva produce, not an echinoid sac, but an infolding that seems to represent the formation of a new larval gut. In larvæ from which the echinoid rudiment has been removed further deviations from the normal process occur and resemble changes observed in some abnormal holothurian larvæ—an observation of much theoretical importance.

IN recent years dried blood has appeared frequently on the market as an animal food, and, considering the large quantities of this material which are available daily from the abattoirs of Great Britain and the increasing difficulties of obtaining nitrogenous food for animals, an inquiry was started as to the value and safety of utilising dried blood as a nitrogen-supplying food. Blood collected in small quantities and stored before drying is useful only as a manure, but blood which is dried immediately after collection may be used as animal food. Mr. L. F. Newman, in the *Journal of the Ministry of Agriculture* for June last, contributes the results of some feeding experiments with dried blood. He concludes that the addition of blood to an ordinary farm ration of wheat offals may cause considerable gain in weight compared with the results from a diet of offals only, while the addition of blood to plain maize-meal may give an increase equal to the results obtained from feeding offals only. Another material which has been suggested as animal food is the bracken rhizome, and a paper by Prof. James Hendrick on "Bracken Rhizomes and their Food Value" appears in the Transactions of the Highland and Agricultural Society of Scotland (1919). Prof. Hendrick carried out preliminary feeding experiments which indicated that bracken rhizomes are not rich enough in the more valuable food constituents to be of much use for anything but maintenance purposes, and even here their usefulness is limited because they are not palatable to certain classes of stock. During the last forty or fifty years, however, considerable damage has been caused by the spreading of bracken on good pasture lands, and it is possible that by utilising the rhizomes for animal food the infested areas can be cleared without incurring much loss.

The October issue of the Journal of the American Chemical Society contains a long paper by Mr. W. D. Harkins on the structure of atoms. Evidence is given for the statement that atoms in which the ratio of negative to positive electrons in the nucleus is high are rare, both in meteorites and on the earth. Suggested constitutions are assigned to the nuclei of the more abundant light atoms. The constituents of atoms are regarded as α-particles, positive electrons (hydrogen nuclei), electrons, particles of mass 3 (ν-particles), and secondary structures of positive and negative electrons (μ-particles).

Engineering for November 5 contains an illustrated account of a large depôt to be used for the storage of wool, now approaching completion at Hull. This building is being constructed for the Ministry of Munitions by Messrs. Nissens, Ltd., of Birmingham, and is a development of the well-known Nissen hut, which proved its practical utility on a wide scale so successfully during the war. The area covered is approximately 10 acres, and construction was commenced only on June 16 last. The depôt consists of eighteen buildings of the Nissen type, each 552 ft. long by 40 ft. wide, all communicating. Each semicircular rib is made up of five segments joined by fish-plates; the ribs are held together by wood purlins. The buildings are double-skinned, with an air-space of 7 in. between the inner and outer linings of galvanised corrugated sheet, and are thus damp-proof and not affected by condensation. Only forty men, on piecework, have been employed, and the rate of building has been approximately one bay of 552 ft. completed per week. The form of construction has several advantages, and is suitable for many purposes. Buildings of practically any length can be made; they are absolutely weather-proof, are capable of erection by unskilled labour, and if lined with 2-in. plaster slabs will be found as cool as brick buildings.

Our Astronomical Column.

The Eclipse of 1922 in Australia.—Further details concerning this eclipse have come to hand. Mr. W. E. Cooke, the Government Astronomer of New South Wales, has visited various points on the Queensland railway within the totality track, and sends a pamphlet containing his experiences. The inhabitants of the villages are willing to give all possible help to observers. The weather prospects are distinctly hopeful, though the altitude of the sun in this region will not be great (26° at most). The most easterly and most accessible station is Stanthorpe, on the Dividing Range, 2656 ft. high, a favourite summer resort, having several good hotels. Those undertaking observations of a delicate nature should go further inland, to Coongoola or Goondiwindi. As there is a branch of the British Astronomical Association in New South Wales, there is reason to hope that all these stations will be occupied. The west coast of Australia in the neighbourhood of Condon or Wallal is favourable as regards height of sun and probability of a clear sky. Mr. H. A. Hunt, the Commonwealth Meteorologist, notes that Wallal, which is a telegraph station, might be reached from Port Hedland, 150 miles to the west-south-west by pearling lugger; a steamer visits Port Hedland about once a month. Mr. Hunt considers the weather prospects much more hopeful here than in Christmas Island. Another possible locality is in Central Australia, near the telegraph station of Charlotte Waters, which is 110 miles from the head of the railway at Codnadatta.

Jupiter's Satellites.—Mr. R. T. A. Innes has carried out a regular series of observations of the eclipses of these satellites, especially of I. and II., since 1908; he gives the main results in Union Obs. Circ. No. 50. On comparing the observed duration of eclipse with the tabular value, there is a regular wave in the residuals with a six-year period, from which it is inferred that the tabular inclination of Jupiter's equator to its orbit needs a positive correction; it is indicated with less certainty that the node of the equator on the orbit needs a negative correction. The tabular values of mean longitude at epoch need the following corrections: I., −0·080°; II., −0·031°; and III., −0·006°. These results are of interest, and they show that the idea, so generally held, that ordinary visual observations of these eclipses are no longer of use, is not correct.

Mr. Innes appeals to all observers to unite in observing the eclipses with special care for the period 1920 December 9 to 1921 May 31. The month February 18 to March 18 may be omitted, as eclipses then take place very near the primary. The disappearance of the last speck of light and the re-appearance of the first speck are the phenomena to which attention should be specially directed. The aperture and condition of seeing should be noted. Mr. Innes points out that observations of satellite I. afford a delicate test of the constancy or otherwise of the earth's rotation.

The Origin of Spectra.—Dr. H. H. Plaskett contributes an interesting article on spectra to the Journal of the Royal Astronomical Society of Canada (vol. xiv., p. 7). The paper summarises Nicholson's work on the atom and that of Planck and Einstein on the quantum theory of light. It is pointed out that there are some serious difficulties in the quantum theory. "Interference can be obtained with a path-difference of more than a million wave-lengths. This seems to require that the quantum must have this length (several feet) in space. Further, the experimental fact that a 3-ft. O.G. has a higher resolving power than a 3-in. can only be interpreted as meaning that the quantum has a 3-ft. cross-section. It is difficult to see how a quantum of such dimensions is indivisible, and if it is, how any light gets into a 3-in. telescope." It is suggested that the facts seem to require some compromise between the undulatory and quantum theories; in fact, the author considers a satisfactory theory of radiation as the first desideratum of future progress, the second being a solution of the three-body problem as applied to the more complex atoms.

Dr. Silberstein's suggestion that the atomic nucleus may not be a homogeneous sphere of positive electricity, but a collection of point charges, is shown to remove some difficulties, but to create others, which have not yet been solved.